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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/726,474	12/01/2003	Masood Murtuza	TI-35639	5891

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TEXAS INSTRUMENTS INCORPORATED
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DALLAS, TX 75265

EXAMINER

DICKEY, THOMAS L

ART UNIT	PAPER NUMBER
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2826

NOTIFICATION DATE	DELIVERY MODE
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09/08/2008

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

uspto@ti.com

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Office Action Summary

Application No.

10/726,474

Applicant(s)

MURTUZA, MASOOD

Examiner

Thomas L. Dickey

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Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 July 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7, 8, 10, 12-14 and 24-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7, 8, 10, 12-14 and 24-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

/Thomas L. Dickey/
Primary Examiner
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Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/09/2008 has been entered.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5, 7, 8, 10, 12, 13, 24, 25, and 27-33 are rejected under 35 U.S.C. 102(b) as being anticipated by Ghoshal (6,204,165).

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With regard to claims 1-5,7, 8, 10, 25,27, and 28 Ghoshal discloses a semiconductor device comprising a substrate 100; a plurality of inter-level dielectric layers (ILD layers 111,113,115,117,119,121) each formed of fluorinated silicon dioxide (note column 3 line 18. Fluorinated silicon dioxide has a dielectric constant of 3.2 to 3.6. Note column 14 lines 38-39 of Zhao 6,198,170. Fluorinated silicon dioxide is therefore a dielectric material having the "low dielectric constant" specified in claim 25) having low dielectric constant (k); at least one support structure 193-171, (elsewhere recited as "a plurality of support structures 193-171") being a via (note column 1 lines 23-26) formed from an aluminum or copper support material disposed in each of the ILD layers 111,113,115,117,119,121 at locations overlying each other so that support structures 193-171 overly each other in the plurality of ILD layers 111,113,115,117,119,121; at least one additional ILD layer 143 having a dielectric constant which is higher than the plurality of ILD layers 111,113,115,117,119,121, said at least one additional ILD layer 143 overlying the plurality of ILD layers 111,113,115,117,119,121; a contact layer forming bond pad 161 located directly above the plurality of support structures 193-171 and overlying the at least one additional ILD layer 143 and the support structures 193-171, wherein the at least one additional ILD layer 143 isolates the contact layer 161 from the support structures 193-171, the support structures 193-171 being located

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underneath the bond pad 161 location and the support structure 193-171 ending at the at least one additional ILD layer 143, and a solder bump 190 overlying the contact surface 161, the plurality of support structures 193-171 being located directly underneath solder bump 190, wherein the at least one support structure 193-171 comprises a first plurality of support structures 193-171 extending along a length of the semiconductor device and a second plurality of support structures 193-171 extending along a width of the semiconductor device, the first and second plurality of support structures 193-171 intersecting perpendicularly with respect to each other. Note figure 1, column 2 lines 52-67, and column 3 lines 1-19 and 34-48 of Ghoshal.

The applicant's claims 1-5, 7, 8, and 10 do not distinguish over the Ghoshal reference regardless of the functions allegedly performed by the claimed device, because only the device per se is relevant, not the recited functions of the support structures being capable of load-bearing and mitigating structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, if such stresses should ever be applied; the support structure or structures being capable of load-bearing and particularly of mitigating damage of the plurality of ILD layers in the event that forces might be applied onto the plurality of ILD layers during subsequent

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processing and packaging of the semiconductor device; said bond pad location being capable of functioning as a source of stress.

Note that functional language in a device claim is directed to the device per se, no matter which of the device's functions is referred to in the claim. *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) ("[A]pparatus claims cover what a device *is*, not what a device *does*" [emphasis in original]), makes it clear that it is the patentability of the device per se which must be determined in a "functional language" claim and not the patentability of the function, and that an old or obvious device alleged to perform a new function is not patentable as a device, whether claimed in "functional language" terms or not. Note that caselaw makes clear that in such cases applicant has the burden of showing that a prior art device that appears reasonably capable of performing the allegedly novel function is in fact incapable of doing so. See *In re King*, 231 USPQ 136 (Fed. Cir, 1986) ("It did not suffice merely to assert that [the cited prior art] does not inherently achieve [the claimed function], challenging the PTO to prove the contrary by experiment or otherwise. The PTO is not equipped to perform such tasks") and *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977) (claiming a new use, new function or unknown property

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which is inherently present in the prior art does not necessarily make the claim patentable). See MPEP § 2114.

In *Ex parte* Smith, 83 USPQ2d 1509 (Bd. Pat. App. & Int. 2007, PRECEDENTIAL), the Board found, "There is nothing in the Specification to indicate that the [property] necessary to render the [claimed structure] [capable of the claimed function] is anything more than the inherent result of constructing the [claimed structure] of standard materials in accordance with claim 35's other limitations, which are expressly disclosed in [the prior art]." The Board held, "We thus agree with the Examiner that a prima facie case of anticipation is established by [the prior art]. Because the Appellant presented no evidence to overcome the Examiner's finding of the inherent ability of [the prior art's] [structure] to [perform the claimed function], she failed to meet her burden to overcome that prima facie case. We therefore find that claim 35 is anticipated by [the prior art]." The Board cited *In re King* for the proposition that "[A] prima facie case of anticipation [may be] based on inherency," and *In re Best* for the proposition that "Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product," in support of its holding. See *Ex parte* Smith,

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83 USPQ2d 1509, 1514 (Bd. Pat. App. & Int. 2007). Applicant will please note that the fact one could reasonably expect the prior art to perform the recited function was enough to support a prima facie finding that the device claimed by virtue of the recital of said function was identical to (or obvious in view of, as the case may be) the prior art device.

In this case it is reasonable to assume that Ghoshal's support structures are capable of the claimed functions of load bearing and mitigating structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, if such stresses should ever be applied; the support structure or structures being capable of load-bearing and particularly of mitigating damage of the plurality of ILD layers in the event that forces might be applied onto the plurality of ILD layers during subsequent processing and packaging of the semiconductor device; said bond pad location being capable of functioning as a source of stress, because a comparison of Applicant's specification to Ghoshal's disclosure reveals that Ghoshal discloses a device having support structures that are apparently identical to the support structures Applicant describes as being capable of performing the functions of load bearing and mitigating structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, if such stresses should ever be applied; the support structure or structures being capable of

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load-bearing and particularly of mitigating damage of the plurality of ILD layers in the event that forces might be applied onto the plurality of ILD layers during subsequent processing and packaging of the semiconductor device. Ghoshal's bond pad location reasonably appears capable of functioning as a source of stress for the same reason.

Because it is reasonable to assume that assume that Ghoshal's device is capable of performing the claimed functions, the burden shifts to Applicants to show that it is not.

See MPEP § 2114.

With regard to claims 12, 13, 29, and 30, Ghoshal discloses a semiconductor device comprising a substrate 100; a plurality of inter-level dielectric layers (ILD layers 111,113,115,117,119,121) each formed of fluorinated silicon dioxide (note column 3 line 18. Fluorinated silicon dioxide has a dielectric constant of 3.2 to 3.6. Note column 14 lines 38-39 of Zhao 6,198,170. Fluorinated silicon dioxide is therefore a dielectric material having the "low dielectric constant" specified in claim 29) having low dielectric constant (k); at least one support structure 193-171 disposed in each of the ILD layers 111,113,115,117,119,121 at locations overlying each other so that support structures 193-171 overlie each other in the plurality of layers; at least one additional ILD layer 143 having a dielectric constant which is higher than the low-k ILD layers 111,113,115,117,119,121 overlying the low-k inter-level dielectric layers; and a contact

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layer 161 overlying the at least one additional ILD layer 143 and the support structures 193-171, wherein the at least one additional ILD layer 143 isolates the contact layer 161 from the support structures 193-171; wherein a plurality of support structures 193-171 are disposed in at least one of the low-k dielectric layers in an $n \times m$ matrix configuration, where n and m are integers greater than one; and wherein the plurality of support structures 193-171 are disposed at a location below a bond pad 161 disposed on the semiconductor device, wherein the support structures 193-171 are disposed in the at least one low-k dielectric layer at a plurality of locations spaced equidistant apart from each other across substantially the entire layer; wherein the $n \times m$ plurality of support structures 193-171 are configured such that the n support structures 193-171 extend along a length of the semiconductor device and the m support structures 193-171 extend along a width of the semiconductor device, the plurality n support structures 193-171 and the plurality m support structures 193-171 intersecting perpendicularly with respect to each other. Note figure 1, column 2 lines 52-67, and column 3 lines 1-19 and 34-48 of Ghoshal.

The applicant's claims 12, 13, 29, and 30 do not distinguish over the Ghoshal reference regardless of the function allegedly performed by the claimed device, because only the device per se is relevant, not the recited function of the support

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structures being capable of load-bearing and mitigating structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, if such stresses should ever be applied. See *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) ("[A]pparatus claims cover what a device *is*, not what a device *does*" [emphasis in original]); *In re King*, 231 USPQ 136 (Fed. Cir, 1986) ("It did not suffice merely to assert that [the cited prior art] does not inherently achieve [the claimed function], challenging the PTO to prove the contrary by experiment or otherwise. The PTO is not equipped to perform such tasks"); *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977) (claiming a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim patentable); and *Ex parte Smith*, 83 USPQ2d 1509 (Bd. Pat. App. & Int. 2007, PRECEDENTIAL) ("There is nothing in the Specification to indicate that the [property] necessary to render the [claimed structure] [capable of the claimed function] is anything more than the inherent result of constructing the [claimed structure] of standard materials in accordance with claim 35's other limitations, which are expressly disclosed in [the prior art]"), cited above. Applicant will please again note that the fact one could reasonably expect the prior art to perform the recited function was enough to support a prima facie finding that the device claimed by virtue of the recital of

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said function was identical to (or obvious in view of, as the case may be) the prior art device.

In this case it is reasonable to assume that Ghoshal's support structures are capable of the claimed functions of load bearing and mitigating structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, because a comparison of Applicant's specification to Ghoshal's disclosure reveals that Ghoshal discloses a device having support structures that are apparently identical to the support structures Applicant describes as being capable of performing the functions of load bearing and mitigating structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers.

Because it is reasonable to assume that assume that Ghoshal's device is capable of performing the claimed function, the burden shifts to Applicants to show that it is not. See MPEP § 2114.

With regard to claims 24 and 31-33, Ghoshal discloses a semiconductor device comprising a substrate 100; a plurality of inter-level dielectric layers (ILD layers 111,113,115,117,119,121) each formed of fluorinated silicon dioxide (note column 3 line 18. Fluorinated silicon dioxide has a dielectric constant of 3.2 to 3.6. Note column 14 lines 38-39 of Zhao 6,198,170. Fluorinated silicon dioxide is therefore a dielectric

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material having the "low dielectric constant" specified in claim 31) having low dielectric constant (k); at least one support structure 193-171 disposed in each of the ILD layers 111,113,115,117,119,121 at locations overlying each other so that support structures 193-171 overly each other in the plurality of layers to mitigate structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers 111,113,115,117,119,121; at least one additional ILD layer 143 having a dielectric constant which is higher than the low-k ILD layers 111,113,115,117,119,121 overlying the low-k inter-level dielectric layers; and a bond pad 161 overlying the at least one additional ILD layer 143 and the support structures 193-171, wherein the at least one support structure 193-171 comprises a first plurality of support structures 193-171 extending along a length of the semiconductor device and a second plurality of support structures 193-171 extending along a width of the semiconductor device, the first and second plurality of support structures 193-171 intersecting perpendicularly with respect to each other. Note figure 1, column 2 lines 52-67, and column 3 lines 1-19 and 34-48 of Ghoshal.

The applicant's claims 24 and 31-33 do not distinguish over the Ghoshal reference regardless of the function allegedly performed by the claimed device, because only the device per se is relevant, not the recited function of the support structures being

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capable of load-bearing and mitigating structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, if such stresses should ever be applied. See *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) ("[A]pparatus claims cover what a device *is*, not what a device *does*" [emphasis in original]); *In re King*, 231 USPQ 136 (Fed. Cir. 1986) ("It did not suffice merely to assert that [the cited prior art] does not inherently achieve [the claimed function], challenging the PTO to prove the contrary by experiment or otherwise. The PTO is not equipped to perform such tasks"); *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977) (claiming a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim patentable); and *Ex parte Smith*, 83 USPQ2d 1509 (Bd. Pat. App. & Int. 2007, PRECEDENTIAL) ("There is nothing in the Specification to indicate that the [property] necessary to render the [claimed structure] [capable of the claimed function] is anything more than the inherent result of constructing the [claimed structure] of standard materials in accordance with claim 35's other limitations, which are expressly disclosed in [the prior art]"), cited above. Applicant will please again note that the fact one could reasonably expect the prior art to perform the recited function was enough to support a

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prima facie finding that the device claimed by virtue of the recital of said function was identical to (or obvious in view of, as the case may be) the prior art device.

In this case it is reasonable to assume that Ghoshal's support structures are capable of the claimed functions of load bearing and mitigating structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, because a comparison of Applicant's specification to Ghoshal's disclosure reveals that Ghoshal discloses a device having support structures that are apparently identical to the support structures Applicant describes as being capable of performing the functions of load bearing and mitigating structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers.

Because it is reasonable to assume that assume that Ghoshal's device is capable of performing the claimed function, the burden shifts to Applicants to show that it is not. See MPEP § 2114.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 7, 8, 10, 24-26, 30, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over LIN (2004/0253801) in view of Peck (3,427,247). In the examiner's opinion, this/these claim(s) would have been obvious according to one of the rationales expressed in the *Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc.*, as published at 72 Federal Register 57526 et seq.¹ (10/10/2007).

The Guidelines explain that an invention that would have been obvious to a person of ordinary skill at the time of the invention is not patentable. The Guidelines point out that, as reiterated by the Supreme Court in KSR, the framework for the objective analysis for determining obviousness under 35 U.S.C. 103 is stated in *Graham v. John Deere Co.* Obviousness is a question of law based on underlying factual inquiries. The factual inquiries enunciated by the Court are as follows:

- (1) Determining the scope and content of the prior art;
- (2) Ascertaining the differences between the claimed invention and the prior art, and
- (3) Resolving the level of ordinary skill in the pertinent art.

Examining this last factor first, it is noted that any obviousness rejection should include, either explicitly or implicitly in view of the prior art applied, an indication of the

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level of ordinary skill. This is an essential finding because (as the Guidelines point out) a finding as to the level of ordinary skill may be used as a partial basis for a resolution of the issue of obviousness. The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. Factors that may be considered in determining the level of ordinary skill in the art include:

- (1) "Type of problems encountered in the art;"
- (2) "prior art solutions to those problems;"
- (3) "rapidity with which innovations are made;"
- (4) "sophistication of the technology;" and
- (5) "educational level of active workers in the field."

In a given case, every factor may not be present, or one or more factors may predominate.

In the present case, Applicant has presented claims to a device classified in Class 257 (Semiconductor Devices). The types of problems encountered in Class 257 typically are highly complex, involving questions of electrodynamics, thermodynamics, crystallography, and quantum mechanics. Prior art solutions to the problems presented in this field demonstrate thinking of the highest order. Many prior art solutions in this field have won Nobel prizes. Past Nobel prizewinners for Class 257 innovations include John Bardeen, William Shockley, Jack Kilby, Leo Esaki, Nick Basow, Zhores Alferov,

¹ Available at <http://www.uspto.gov/web/offices/com/sol/notices/72fr57526.pdf>

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Pierre-Gilles de Gennes, and probably a half dozen more this writer has forgotten. Innovations in Class 257 are made with extremely high rapidity (see, e.g. "Moore's Law"). Technology used to make and practice inventions in this field are highly sophisticated. Some "fabs" (as those of skill in the art call the factories for making these devices) now cost in excess of one billion dollars each, and perform literally hundreds of billions of operations per hour. Finally, the educational level of active workers in this field is very high – Ph.D.s are common, and a bachelor's degree in engineering is the absolute minimum educational level of workers in this field.

In short, the level of ordinary skill in this field is extremely high. In *KSR*, the Supreme Court cautioned, "A person of ordinary skill is also a person of ordinary creativity." *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1742, 82 USPQ2d 1385, 1397 (2007). Had the Court taken a look at the people who have practiced the semiconductor art in the past and the variety of extraordinarily valuable (from lifestyle-changing, such as high-speed communications and computing, to handy devices such as iPods and cellphones) and difficult solutions to challenging problems those people have accomplished, the Court might easily have said that in the semiconductor art the person of ordinary skill is a person of extraordinary creativity.

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Next, we consider the first and second factual findings required by *Graham*. With regard to claims 1-5,7, 8, 10, 25, and 26, the scope and content of the prior art includes, in the Lin disclosure, a description of a semiconductor device comprising a substrate 50; a plurality of inter-level dielectric layers (ILD layers 30,32,60,64) formed (note paragraphs 0040-0041) of a low dielectric liquid fluorocarbon; at least one support structure 30 (elsewhere recited as "a plurality of support structures"), being a via or trench (note paragraph 0070) formed from an tungsten support material disposed in each of the ILD layers 30,32,60,64 at locations overlying each other so that support structures 30 overly each other in the plurality of ILD layers 30,32,60,64; at least one additional ILD layer 24 having a dielectric constant which is higher than the low dielectric liquid fluorocarbon ILD layers 30,32,60,64; the at least one additional ILD layer 24 overlying the plurality of ILD layers; and a contact layer forming bond pad 18 overlying the at least one additional ILD layer 24 and the support structures 30, wherein the at least one additional ILD layer 24 isolates the contact layer 18 from the support structures 30, the support structures 30 being located underneath the bond pad 18 location and the support structure 30 ending at the at least one additional ILD layer 24. Note figures 1, 6, 7, and paragraphs 0062-0077 of Lin.

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The applicant's claims 1-5, 7, 8, 10, 25, and 26 do not distinguish over the Lin reference regardless of the functions allegedly performed by the claimed device, because only the device per se is relevant, not the recited functions of the support structures being capable of load-bearing and mitigating damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, if such stresses should ever be applied; the support structure or structures being capable of load-bearing and particularly of mitigating damage of the ILD layer in the event that forces might be applied onto the ILD layer during subsequent processing and packaging of the semiconductor device; said bond pad location being capable of functioning as a source of stress.

Note that functional language in a device claim is directed to the device per se, no matter which of the device's functions is referred to in the claim. *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) ("[A]pparatus claims cover what a device *is*, not what a device *does*" [emphasis in original]), makes it clear that it is the patentability of the device per se which must be determined in a "functional language" claim and not the patentability of the function, and that an old or obvious device alleged to perform a new function is not patentable as a device, whether claimed in "functional language" terms or not. Note that caselaw makes

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clear that in such cases applicant has the burden of showing that a prior art device that appears reasonably capable of performing the allegedly novel function is in fact incapable of doing so. See *In re King*, 231 USPQ 136 (Fed. Cir, 1986) ("It did not suffice merely to assert that [the cited prior art] does not inherently achieve [the claimed function], challenging the PTO to prove the contrary by experiment or otherwise. The PTO is not equipped to perform such tasks") and *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977) (claiming a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim patentable). See MPEP § 2114.

In *Ex parte Smith*, 83 USPQ2d 1509 (Bd. Pat. App. & Int. 2007, PRECEDENTIAL), the Board found, "There is nothing in the Specification to indicate that the [property] necessary to render the [claimed structure] [capable of the claimed function] is anything more than the inherent result of constructing the [claimed structure] of standard materials in accordance with claim 35's other limitations, which are expressly disclosed in [the prior art]." The Board held, "We thus agree with the Examiner that a prima facie case of anticipation is established by [the prior art]. Because the Appellant presented no evidence to overcome the Examiner's finding of the inherent ability of [the prior art's] [structure] to [perform the claimed function], she failed to meet her burden to overcome

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that prima facie case. We therefore find that claim 35 is anticipated by [the prior art].” The Board cited *In re King* for the proposition that “[A] prima facie case of anticipation [may be] based on inherency,” and *In re Best* for the proposition that “Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product,” in support of its holding. See *Ex parte Smith*, 83 USPQ2d 1509, 1514 (Bd. Pat. App. & Int. 2007). Applicant will please note that the fact one could reasonably expect the prior art to perform the recited function was enough to support a prima facie finding that the device claimed by virtue of the recital of said function was identical to (or obvious in view of, as the case may be) the prior art device.

In this case it is reasonable to assume that Lin’s support structures are capable of the claimed functions of load bearing and mitigating damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, if such stresses should ever be applied; the support structure or structures being capable of load-bearing and particularly of mitigating damage of the ILD layer in the event that forces might be applied onto the ILD layer during subsequent processing and packaging of the

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semiconductor device; said bond pad location being capable of functioning as a source of stress, because a comparison of Applicant's specification to Lin's disclosure reveals that Lin discloses a device having support structures that are apparently identical to the support structures Applicant describes as being capable of performing the functions of load bearing and mitigating damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, if such stresses should ever be applied; the support structure or structures being capable of load-bearing and particularly of mitigating damage of the ILD layer in the event that forces might be applied onto the ILD layer during subsequent processing and packaging of the semiconductor device. Lin's bond pad location reasonably appears capable of functioning as a source of stress for the same reason.

Because it is reasonable to assume that Lin's device is capable of performing the claimed function, the burden shifts to Applicants to show that it is not. See MPEP § 2114.

With regard to claims 24, 30, and 31, the scope and content of the prior art includes, in the Lin disclosure, a description of a semiconductor device comprising a substrate 50; a plurality of inter-level dielectric layers (ILD layers 30,32,60,64) each formed (note paragraphs 0040-0041) of a low dielectric liquid fluorocarbon; at least one support structure 30 disposed in each of the ILD layers 30,32,60,64 at locations overlying each

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other so that support structures 30 overly each other in the plurality of layers; at least one additional ILD layer 24 having a dielectric constant which is higher than the low-k ILD layers 30,32,60,64; the at least one additional ILD layer 24 overlying the plurality of ILD layers; and a bond pad 18 overlying the at least one additional ILD layer 24 and the support structures 30. Note figures 1, 6, 7, and paragraphs 0062-0077 of Lin.

The applicant's claims 24, 30, and 31 do not distinguish over the Lin reference regardless of the function allegedly performed by the claimed device, because only the device per se is relevant, not the recited function of the support structures being capable of load-bearing and mitigating damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, if such stresses should ever be applied. See *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) ("[A]pparatus claims cover what a device *is*, not what a device *does*" [emphasis in original]); *In re King*, 231 USPQ 136 (Fed. Cir. 1986) ("It did not suffice merely to assert that [the cited prior art] does not inherently achieve [the claimed function], challenging the PTO to prove the contrary by experiment or otherwise. The PTO is not equipped to perform such tasks"); *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977) (claiming a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim

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patentable); and *Ex parte* Smith, 83 USPQ2d 1509 (Bd. Pat. App. & Int. 2007, PRECEDENTIAL) ("There is nothing in the Specification to indicate that the [property] necessary to render the [claimed structure] [capable of the claimed function] is anything more than the inherent result of constructing the [claimed structure] of standard materials in accordance with claim 35's other limitations, which are expressly disclosed in [the prior art]"), cited above. Applicant will please again note that the fact one could reasonably expect the prior art to perform the recited function was enough to support a prima facie finding that the device claimed by virtue of the recital of said function was identical to (or obvious in view of, as the case may be) the prior art device.

In this case it is reasonable to assume that Lin's support structures are capable of the claimed functions of load bearing and mitigating damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers, because a comparison of Applicant's specification to Lin's disclosure reveals that Lin discloses a device having support structures that are apparently identical to the support structures Applicant describes as being capable of performing the functions of load bearing and mitigating damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers.

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Because it is reasonable to assume that Lin's device is capable of performing the claimed function, the burden shifts to Applicants to show that it is not. See MPEP § 2114.

The difference between the prior art semiconductor device disclosed by Lin and the device claimed in claims 1-5, 7, 8, 10, 24-26, 30, and 31 is that, where the claims require a ILD layers formed of a dielectric material having an ultra-low dielectric constant between about 1.0 and about 2.7, Lin's semiconductor device includes ILD layers formed of a low dielectric liquid fluorocarbon.

However, Peck discloses a semiconductor device with ILD layers formed from "Freon" E-3, a liquid fluorocarbon produced by E. I. du Pont de Nemours & Co., Inc., having a dielectric constant of 2.58. Note column 2 lines 32-35 of Peck. The question is, taking into account the high level of education, skill, and creativity of one of ordinary skill in the semiconductor art, would it have been obvious to achieve the invention of claims 1-5, 7, 8, 10, 24-26, 30, and 31 by substituting the ILD layers formed of "Freon" E-3 liquid fluorocarbon having a dielectric constant of 2.58 taught by Peck for Lin's ILD layers formed of a low dielectric liquid fluorocarbon?

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To reject a claim on the basis of the rationale expressed in section IIIB of the *Examination Guidelines*, Office personnel first must resolve the Graham factual inquiries (as has just been done). Office personnel must then articulate the following:

- (1) a finding that the prior art contained a device (method, product, etc.) which differed from the claimed device by the substitution of some components (step, element, etc.) with other components;
- (2) a finding that the substituted components and their functions were known in the art;
- (3) a finding that one of ordinary skill in the art could have substituted one known element for another, and the results of the substitution would have been predictable; and
- (4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

As explained above, Lin discloses a device (semiconductor device) that differed from the claimed device only by the substitution of some components (ILD layers formed of "Freon" E-3 liquid fluorocarbon having a dielectric constant of 2.58) for other components (ILD layers formed of a low dielectric liquid fluorocarbon). Peck discloses that the substituted components and their functions were known in the art. Further, Peck discloses that those of skill in the art were familiar with a method of combining ILD layers formed of "Freon" E-3 liquid fluorocarbon having a dielectric constant of 2.58 with a semiconductor device similar to Lin's semiconductor device. From the similarities between Peck's semiconductor device and Lin's semiconductor device, one of skill in the art would have been able to conclude that ILD layers formed of "Freon" E-3 liquid fluorocarbon having a dielectric constant of 2.58 could have substituted for the ILD

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layers formed of a low dielectric liquid fluorocarbon of Lin's semiconductor device. One of skill in the art would have had reason to predict (based on its functioning in combination with Peck's semiconductor device) that ILD layers formed of "Freon" E-3 liquid fluorocarbon having a dielectric constant of 2.58 would have continued functioning much as they did in combination with Peck's semiconductor device, and that after the substitution, Lin's semiconductor device would continue functioning in the manner disclosed by Lin. It would therefore have been obvious to a person having skill in the art to modify Lin's semiconductor device by substituting the ILD layers formed of "Freon" E-3 liquid fluorocarbon having a dielectric constant of 2.58 taught by Peck for Lin's ILD layers formed of a low dielectric liquid fluorocarbon.

The Guidelines point out that the both the Graham and KSR decisions require Office personnel to evaluate objective evidence relevant to the issue of obviousness. Such evidence, sometimes referred to as "secondary considerations," may include evidence of commercial success, long-felt but unsolved needs, failure of others, and unexpected results. The evidence may be included in the specification as filed, accompany the application on filing, or be provided in a timely manner at some other point during the prosecution. The weight to be given any objective evidence is decided on a case-by-

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case basis. The mere fact that an applicant has presented evidence does not mean that the evidence is dispositive of the issue of obviousness.

For evidence of unexpected results one must rely solely on evidence supplied by Applicants. Applicants have actually made the claimed combination. Evidence of differences between results of the actual functioning of the claimed combination and the results of the functioning one of skill in the art would have had reason to predict (i.e., the "expected results") must necessarily come from one who has actually made the combination. A clear case of unexpected results would be if the claimed combination of prior art elements did not in fact perform according to their established functions in a predictable fashion; a result sometimes referred to as "synergy." See *Anderson's-Black Rock v. Pavement Co.* 396 U.S. 57, 61 (1969) (note that the *Anderson's-Black Rock* opinion does not actually employ the word "synergy"). However, the Guidelines make it clear that any type of unexpected results (and indeed any type of secondary considerations) must be considered.

Applicants' specification, however, does not include any evidence of secondary considerations. Applicants disclose that the claimed combination "may be" made; Applicants do not disclose any unexpected results or indeed any results at all.

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Response to Arguments

3. Applicant's arguments filed 06/09/2008 have been fully considered but they are not persuasive.

The plurality of inter-level dielectric (ILD) layers of claims 1, 12, and 24 are now recited to be "substantially non-load bearing". The Examiner notes the absence of a recital of any actual loads in the claims. In the absence of actual loads, a recital of a "substantially non load bearing" limitation appears at first glance to be nothing more than a recital of intended use, or rather a recital of intended non-use (i.e. "negative" intended use recital).

Further, the at least one support structure of claims 1, 12, and 24 is/are now recited as "load bearing". The Examiner again notes the absence of a recital of any actual loads in the claims. In the absence of actual loads, a recital of a "load bearing" limitation appears at first glance to be nothing more than a recital of intended use.

It is further noted that the claims already recite that "support structures [there are, apparently, more than one support structures, despite Applicants' apparent ambivalence on that topic, expressed in the form of the recital of "at least one support structure"] overly each other in the plurality of layers to mitigate structural damage of the plurality of ILD layers caused by stresses to the plurality of ILD layers."

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The claim limitations, "substantially non load bearing ILD layers" and "at least one load bearing support structure" must be given their broadest reasonable interpretation in light of Applicants' specification. At paragraph 0027 of their disclosure, Applicants explain, "The support structure can mitigate damage to the ILD layer of the semiconductor device by providing a ... support structure [to] take up mechanical force applied to the semiconductor device so that the ILD layer does not generally participate in load bearing." At paragraph 0032 of their disclosure, Applicants explain, "The support system 25 takes up stress (e.g., mechanical force) applied to the semiconductor device 10 during the fabrication process as well as during the packaging process so that damage to the low-k dielectric layers 18 and 22 can be mitigated." At paragraph 0034 of their disclosure, Applicants explain, "The support system takes up stress that is applied to the semiconductor device so that the low-k dielectric layers' participation in load bearing for the semiconductor device is substantially minimized. Thus, the support system can mitigate potential damage (e.g., cracks) to the low-k dielectric layers." In light of Applicants' disclosure, the limitations "load bearing support structure(s)" and "substantially non-load bearing ILD layers" seem to be substantially the same limitation as the previously recited limitation that the support structures "mitigate structural damage ... caused by stresses".

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It also appears that, as to the non-load bearing properties of the ILD layers, Applicants have simply discovered "previously unappreciated properties" of the sort discussed in *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). See MPEP § 2112.01. Applicants' ILD layers (like those of the prior art) are made from spin-on dielectrics (SOD), hydrogen silsesquioxane (HSQ), silicon oxyfluoride, or fluorinated amorphous carbon, all of which have much higher moduli of elasticity than the moduli of elasticity of the aluminum, aluminum alloy, copper, copper alloy, tungsten, or tungsten alloys that form Applicants' (and the prior art's) support structures. It appears reasonable to assume the higher moduli of elasticity (i.e., "softer" or "weaker") materials are capable of yielding when one attempts to place them under load, leaving the lower moduli of elasticity ("harder," "stronger") aluminum, aluminum alloy, copper, copper alloy, tungsten, or tungsten alloy support structures to bear the load. A prior art disclosure that fails to demonstrate proper appreciation for this property may nonetheless be reasonably presumed to have inherently disclosed it. Applicants' attention is drawn to *Leggett & Platt, Incorporated v Vutek, Inc.* (Fed Cir, 2007-1515, 8/21/2008), which explains, once again, that when a claim written with functional rather than structural language, the claim limitation will be anticipated so long as the prior art is able to perform the function. The *Leggett* opinion cites *In re Schreiber*, 128 F.3d 1473,

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1478 (Fed. Cir. 1997), which, in the *Leggett* court's view, had previously explained that "a risk of functional claiming [such as a recital of 'load bearing' or 'non-load bearing' in the absence of the recital of an applied load] is that the functional limitation may be an inherent characteristic of the prior art."

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas L. Dickey whose telephone number is 571-272-1913. The examiner can normally be reached on Monday-Thursday 8-6.

If attempts to reach the examiner by telephone are unsuccessful, please contact the examiner's supervisor, Sue A. Purvis, at 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you

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have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**/Thomas L. Dickey/
Primary Examiner
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